9/28/16 "Its always too early to quit." -Norman Peale

HW: Text page 307-308 #8-30 even
Test 2 on Wednesday 10/19

AIM: How do we solve exponential equations?

Warm Up:

Express each number as a power ex) $9 = 3^2$

1) $25 = \boxed{5^2}$

5 5

2) $1000 = \boxed{10^3}$

10 100

10 10

3) $\frac{1}{8} = \frac{1^3}{2^3} = \left(\frac{1}{2}\right)^3$

4) $0.001 = \frac{1}{1000} = \frac{1}{10^3} = \left(\frac{1}{10}\right)^3$

8

2 4

2 2

Solve each of the following and check:

5) $3^{x} = 3^{2x-2}$

$x = 2x - 2$
$-2x \quad -2x$

$\frac{-x}{-1} = \frac{-2}{-1}$

$x = 2$

Check:

$3^{2} = 3^{2(2)-2}$

$9 = 3^{2}$

$9 = 9$ ✓

IF the bases are =, the exponents are = too!

$x = 2x-2$ also =

$3 = 3$

BASES =

6) $2^{2x} = 8$

$(2)^{2x} = (2^{3})$

$2^{2x} = 2^{3}$

① CAN we re-write one base to match the other?

② Do the bases match?

$\frac{2x}{2} = \frac{3}{2}$

$x = \frac{3}{2}$

If the bases of an exponential equation are the same, then set the exponents equal and solve.

If the bases are not the same, try to re-write one or both of them in order to get a common base. (Use powers)

7) $5^{x-1} = .04$

$5^{x-1} = \frac{4}{100}$

$5^{x-1} = \frac{1}{25}$

1

$5^{x-1} = \frac{1}{5^2}$

$5^{x-1} = 5^{-2}$

$x-1 = -2$

$+1 \quad +1$

$x = -1$

8) $9^x = 27$

$9 = 3^2$

$27 = 3^3$

$(3^2)^x = 3^3$

$3^{2x} = 3^3$

$\frac{2x}{2} = \frac{3}{2}$

$x = \frac{3}{2}$

9) $4^{x+1} = 8^{x}$

$4 = 2^2$

$8 = 2^3$

$(2^2)^{x+1} = (2^3)^{x}$

$2^{2x+2} = 2^{3x}$

$2x+2 = 3x$

$-2x \quad -2x$

$\boxed{2 = x}$

10) $\left(\frac{1}{9}\right)^{x} = 27^{1-x}$

$9 = 3^2$

$27 = 3^3$

$(9^{-1})^{x} = 27^{1-x}$

$9^{-1x} = 27^{1-x}$

$(3^2)^{-1x} = (3^3)^{1-x}$

$3^{-2x} = 3^{3-3x}$

Exponents

$-2x = 3-3x$

$+3x \quad +3x$

$\boxed{x = 3}$

$\boxed{\text{(*) if the bases are = the exponents are =}}$

CW/HW

1) $4^{x+2} = 4^3$

$x+2 = 3$

$-2 \quad -2$

$x = 1$

even/odd

2) $\left(x^{\frac{2}{3}}\right)^{\frac{3}{2}} = 16^{\frac{3}{2}}$

$x = \pm 64$

HW: worksheet #1-15 odd

HW:

8) 2^5

10) $\left(\frac{1}{6}\right)^3$

12) $\left(\frac{1}{2}\right)^3$

14) $\left(\frac{2}{5}\right)^2$

16) 3

18) -2

20) -2

22) 2

24) -1

26) -2

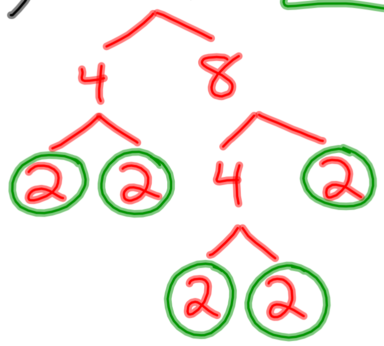
28) 3

30) 3

12) $.125 = \frac{1}{8} = \frac{1}{2^3}$

$$\frac{125}{1000} = \frac{1}{8} = \frac{1}{2^3} = \left(\frac{1}{2}\right)^3 \text{ or } 2^{-3}$$

8) $32 = \boxed{2^5}$



26) $9^{x-1} = 27^x$

$9 = 3^2$

$27 = 3^3$

$(3^2)^{x-1} = (3^3)^x$

$3^{2x-2} = 3^{3x}$

$$\begin{aligned} 2x - 2 &= 3x \\ -2x \quad &\quad -2x \\ \hline \boxed{-2 = x} \end{aligned}$$

⊛ If the bases are equal set the exponents equal and solve.

⊛ If the bases are not equal rewrite one or both bases as a power of the same base.

Ex $9 = 3^2$
$27 = 3^3$ } same base

22) $3^{x+2} = 9^{x}$

$9 = 3^{2}$

$3^{x+2} = (3^{2})^{x}$

$3^{x+2} = 3^{2x}$

$$\begin{array}{r} x+2=2x \\ -x \quad\quad -x \\ \hline 2=x \end{array}$$

30) $\left(\frac{1}{4}\right)^{x} = 8^{1-x}$

$2^{2} = 4$

$2^{3} = 8$

$(4^{-1})^{x} = 8^{1-x}$

$(2^{2})^{-1x} = (2^{3})^{1-x}$

Exponents

$$\begin{array}{r} -2x = 3-3x \\ +3x \quad\quad +3x \\ \hline x=3 \end{array}$$

$$\frac{1}{4^1} = 1 \cdot 4^{-1} = 4^{-1}$$

14) $.16 = \frac{16}{100} = \frac{4}{25} = \frac{2^2}{5^2} = \boxed{\left(\frac{2}{5}\right)^2}$